Notebook Series -- Notebooks by Experimenters Other Than Edison
Navy and Wartime Research Experiments
Submarine Detection Books
Notebook N-18-03-29

This notebook was used by William Deans, William A. Hayes, and Sherwood T. (Sam) Moore during March-April 1918 for experimental work done at sea on submarine detection. Included are notes on experiments with sound detection and recording. Several entries contain notations regarding Edison's comments, suggestions, and instructions. There are also some rough drawings by Edison. The book contains 27 numbered pages, some of which are blank.

Wm. Dean.
Key West.

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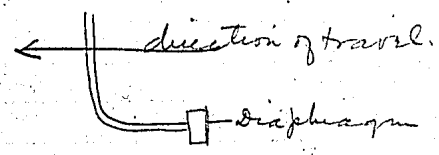
March 29th.

" Trials over side of launch

Apparatus 5/8" inside dia. brass pipe rubber diaphragm.

1 Diaphragm pointing backward.



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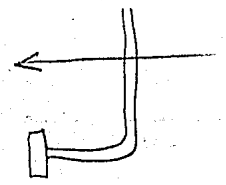

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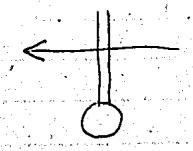


For quietness with boat in motion #2 is undoubtedly the best. #1 and #3 are about the same — very loud

#2 is comparatively quiet but still there is enough noise so that the detection of any noise is impossible.

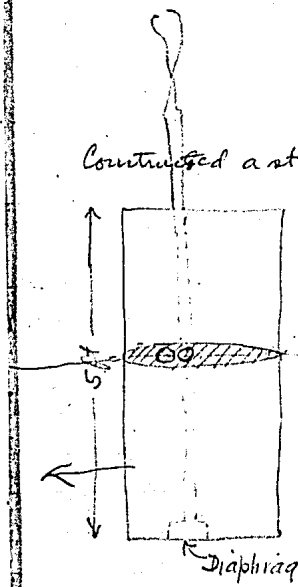
With boat still but engine running any position gives the same results. Can hear noise of own engines loud enough so that outside noises could not be heard.

Standing still with engine shut down there are no outside noises except a water gurgle. and conditions are about the same as working from dock with perhaps less local noises.

A depth of about 4 feet seems to be the best. For depths of 4 feet and above the conditions are about the same. A depth of 4 ft or 4 ft 6 in. is then about the best depth at which to work.

Speed of boat in tests while in motion about 7 knots per hour

April 3, 1918

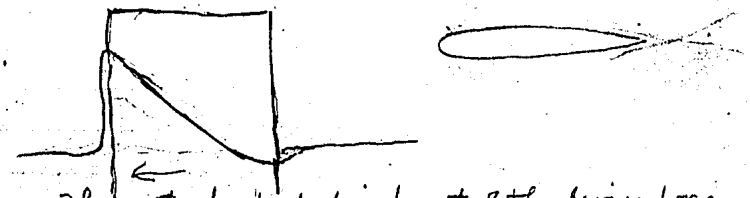


Constructed a stream line device as shown.

Tried out over side of launch. At 3 knots/hr. there is hardly any noise. At 5 knots/hr. noise was reduced about 90% compared with noise using bare pipe. At 7 knots noise increased a little and at 10 knots the noise is very much less than the noise with the bare pipe running 5 knots but still there is too much noise to detect the slight noise made by a boat.

The noise of the engine in our own boat could be heard up to 5 knots.

This device does not create much disturbance in the water. Two men held it at 10 knots with less effort than holding the bare pipe at 5 knots.



The water banked up in front of the device for a distance of about 9 inches (as shown to the left above) when travelling 10 knots/hr. It did not create a great disturbance in the water. At the stern there was

a small wave set up, about 18" astern, where the water seemed to come together from each side. There was however, no pocket at the side except at the stern where the water was about 2 inches lower than the water level.

April 4th.

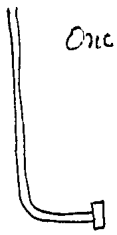
Tried stream line apparatus as above with boat moving and tried to listen for standard Bell. We found that the bell could not be heard while the engine of the boat was running whether which the boat were moving or not.

Tried a still test — apparatus stationary Heard standard Bell distance of 250 feet.

April 4th.

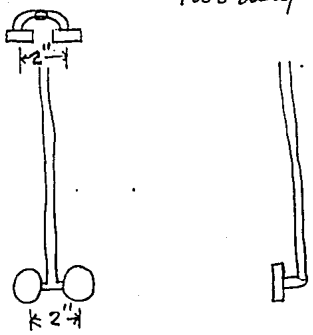
Apparatus #1

One diaphragm.



Apparatus #2

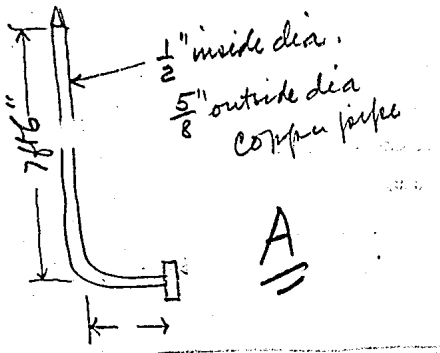
Two diaphragms.



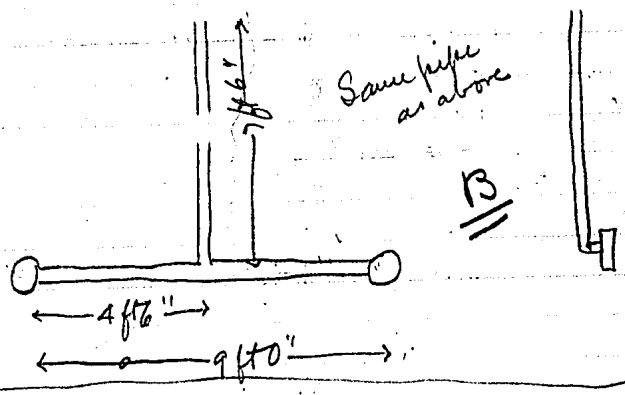
Apparatus No. 1 Bell heard by Hayes 610ft by Drake 690ft
" " 2 " " " " 660" " " 650"

No difference for distance.
distance 650 feet.

High tide, still water.

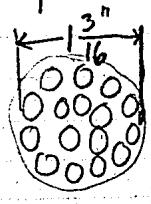


A



B

Supporting disks for rubber 16 – 1/4" holes



I

April 5th.

Tried pipe as in A (on opposite page) (one rubber diaphragm.
Distance 640 feet.

For pipe as in B — two rubber diaphragms.
Distance 675 feet

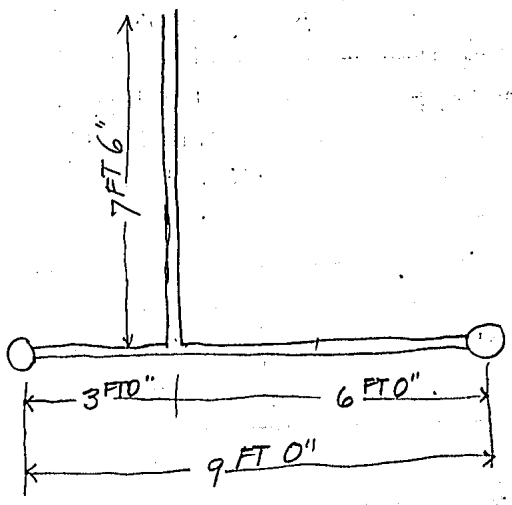
With this pipe the position of the diaphragms with respect to the source of sound makes no difference in the intensity of the sound heard.

II With mica diaphragm 0.005 in thick between pipe and hearing tubes.

With Single Diaphragm apparatus
Distance 550 ft.

With Two Diaphragm - apparatus
Distance 550 ft.

Standard Bellwood.
High tide - still water.



Diaphragms and disks same as in previous apparatus — 16-$\frac{1}{4}$" holes

April 6th

With apparatus as shown on opposite page the standard Bell can be heard 650 ft.

There was no difference in the intensity of the sound heard for revolution through a complete circle about a vertical axis thru the upright pipe.

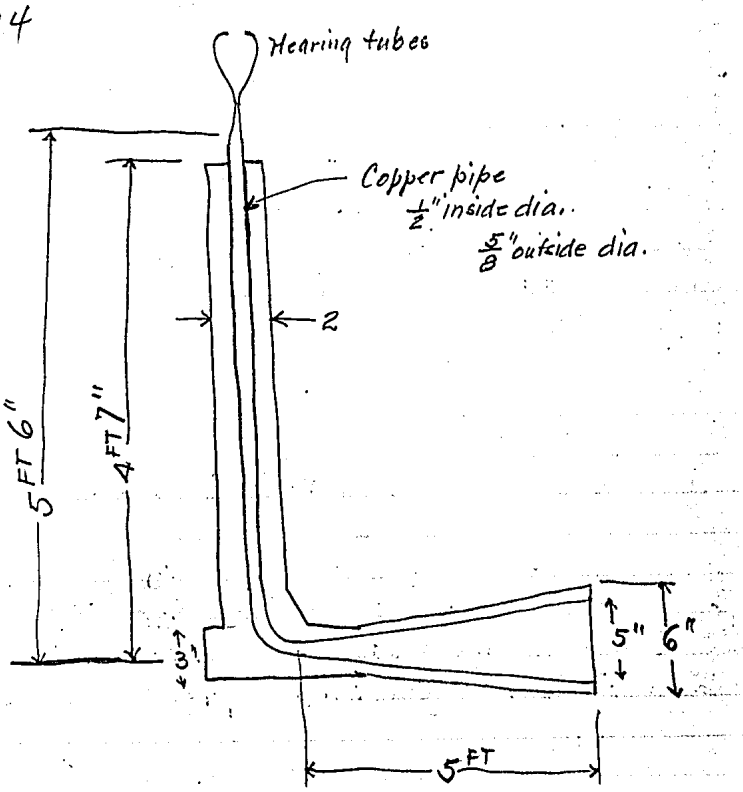


Plate in end (wide mouth) of horn $\frac{3}{16}$" thick contains 277 — $\frac{1}{4}$" holes dia. of envelopping circle = $5\frac{5}{16}$"

Ratio Sum of area of small holes to area of one of dia $5\frac{5}{16}$" = 61%

$$\frac{277 \times (\frac{1}{4})^2}{(5\frac{5}{16})^2} = \frac{277}{16} \times \left(\frac{16}{85}\right)^2 = \frac{277}{16} \times \frac{16}{7225} = 61\%$$

equiv dia = $\sqrt{61} \times 5\frac{5}{16} = 4.15$"

April 8th

With apparatus as shown on opposite page. Standard Bell can be heard 400 feet.

Same results with thin rubber very tightly and loosely stretched and with heavy rubber very tightly stretched.

Mr. E. says – try same apparatus with cylindrical device extending 30" from end of funnel.
Hayes & Evans.

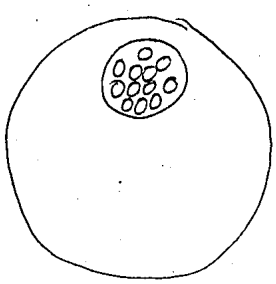
April 12th

Tried out above apparatus fitted with hood 30" long. Heard Standard Bell 750 feet. Removing hood reduce distance bell can be heard to 550 feet. Actual ring of Bell can be heard.

Fitted apparatus A of page 10, with mica diaphragm .015" thick. Distance 750 feet. Actual ring of bell can be heard very clearly.

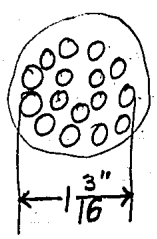
Water very calm – high tide still water.
Hayes & Evans.

We found that when horn with hood on is pointing at Bell the sound is louder than for any other position. When the horn points directly at the bell, the sound heard is more distinct than for any other position.



Each disk as follows.

16 — $\frac{1}{4}$" holes.

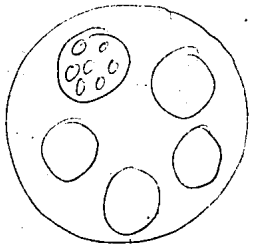


Ratio aggregate area of small holes to area one $1\frac{3}{16}$" dia = 71%.

Apr. 10th

Experiment given by Mr. E.

Have diaphragms made up in mouth of horn. Each small one to be like other small ones.



April 13th.

Tried this device with mica diaphragms but at 500 feet distance, the diaphragms leaked and with water in the device, the test had to be discontinued. Hood used on horn.
Mica 1/2/1000.

April 14th

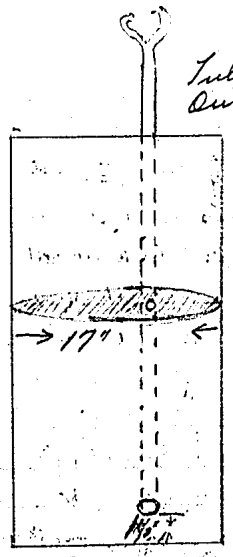
Tried the above device fitted with rubber diaphragms. Could hear bell 865 feet.

Then tried the single diaphragm, small pipe, apparatus, as shown at A page 10, for comparison. With this device the bell could be heard the same distance viz 865 feet.

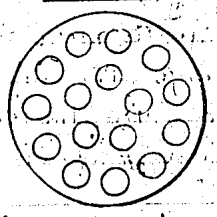
Hood used on large horn apparatus.

Water — calm - high tide. Water was very clear — could see bottom through 28 feet of water.

Outside noises very slight. W.A.H.+W.D.



Diaphragm



Mica 1½/1000

Diameter 1 5/16

Holes in brass disc 1/4"
16 Holes Stock 1/16 in thickness

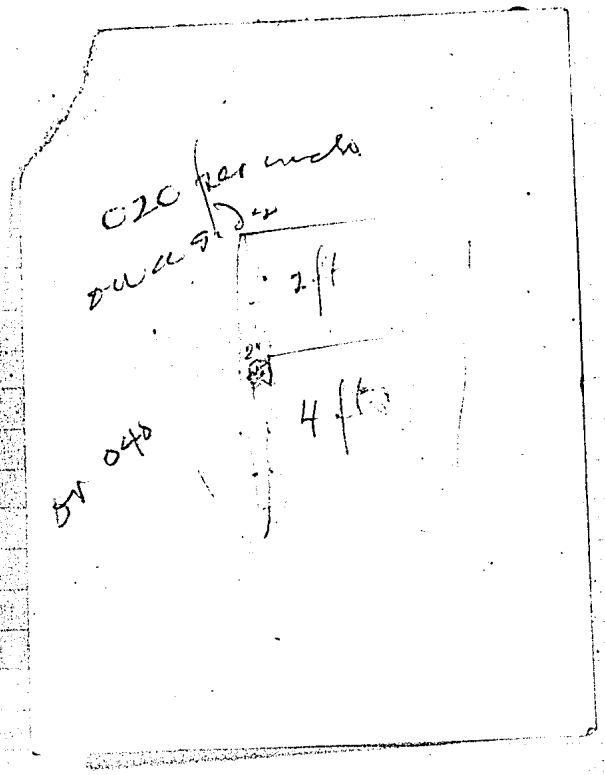
Tried out device as per sketch on opposite page with diaphragm on side instead of bottom. Used on page 5 also used mica 1½/1000 in thickness instead of stretched dental dam rubber.
Placed man ringing bell on long dock and using Gaelian launch we made numerous tests at different speeds in order to ascertain the distance bell could be heard.

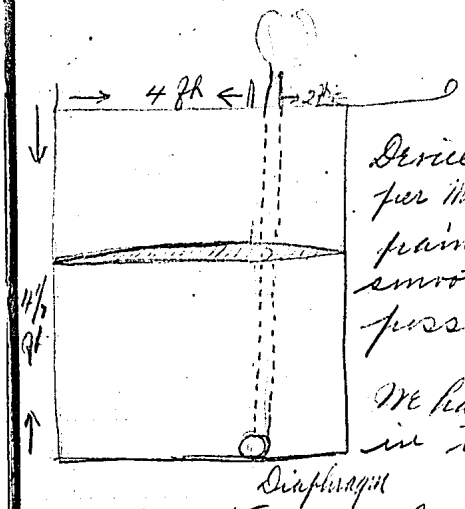
We found water noises almost nil but could get boat noises very plainly.

At 3 knots could hear bell 250 feet
" 6 " " " " 250 "
" 10 " boat, that is the noises of our own engine was so great we could not distinguish bell sound.

Diaphragm on side much more sensitive than on bottom.

Reported to Mr E. and suggested new device as per sketch ~~at next page~~
Hayes + Moore.



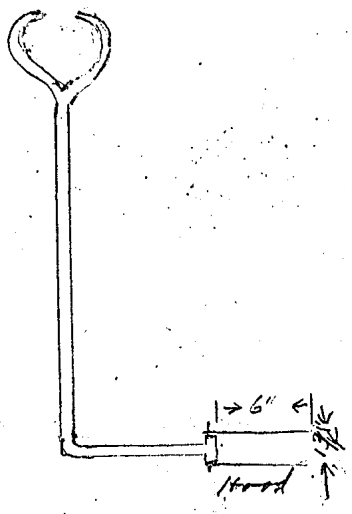


Device made of wood as per M & Shell on opp page painted to get as smooth a surface as possible

We had no difficulty in towing this apparatus and could hear the bell at 600 feet, with launch running about 6 knots.

The diameter of above was 2" at widest point.

Hardly any water noises but could hear engine of launch plainly but did not prevent hearing of bell.



Pipe measured 1/2" inside
" " 5/8 outside and
metal copper.

Made trial with device as per sketch on opposite page and while the water was very rough was able to hear bell 800 feet

Then took hood off and best I could get was distance 650 feet

When hood is on water noises are reduced at least 50%

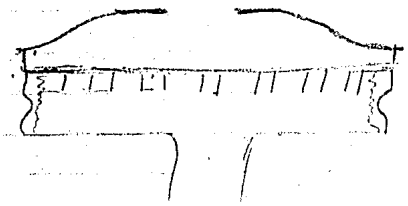
Made trial with device same as above only reduced to 2/3 the size and 1/8" holes instead 5/16" and could hear bell 450 ft with hood and 275 without hood.

A mica diaphragm was used 1/2/1000 thick

Made up diaphragm following M.T.C. instructions same as used in standard. 16-1/2" holes and 1/1000 mica. Then put test on mica crossing a hole with brass rod 1/8" diameter and found same would stand weight of 6 lbs 9 oz. before distorting mica

Made tests of 3 different lengths of hood 6" – 12" 18" and found that 6" was best getting 850 ft. 12" was next best getting 800 and 18" the best was 1450 feet.
The longer the hood the weaker the bell.

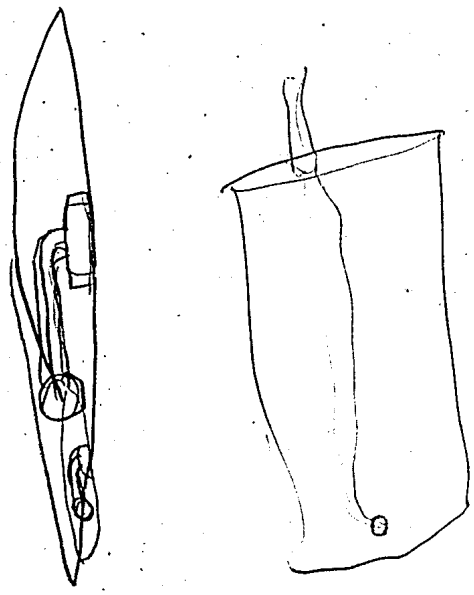
Made following attachment to place over diaphragm



and found it weakened diaphragm very much getting bell at 170 ft
then put 6" hood on and could get 210 ft. only

Try again as Mr C says there must be something wrong

550 - Loose Bell - still Nicks



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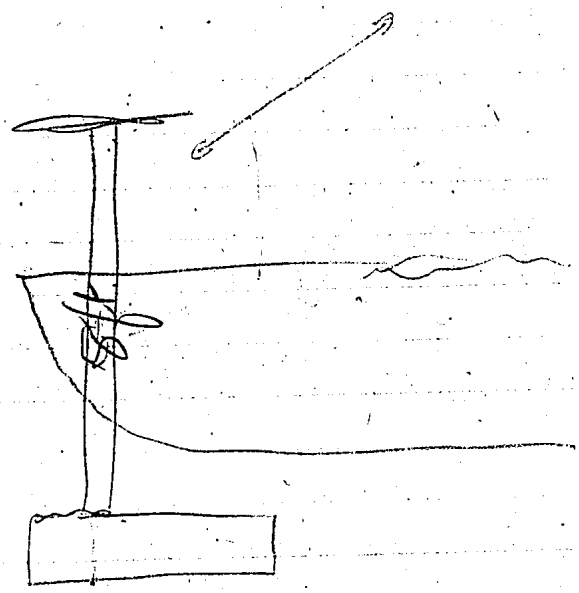

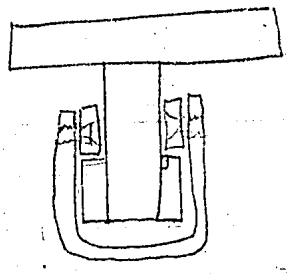

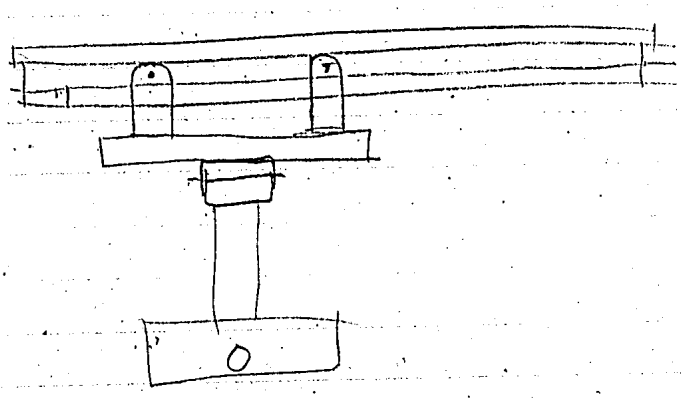

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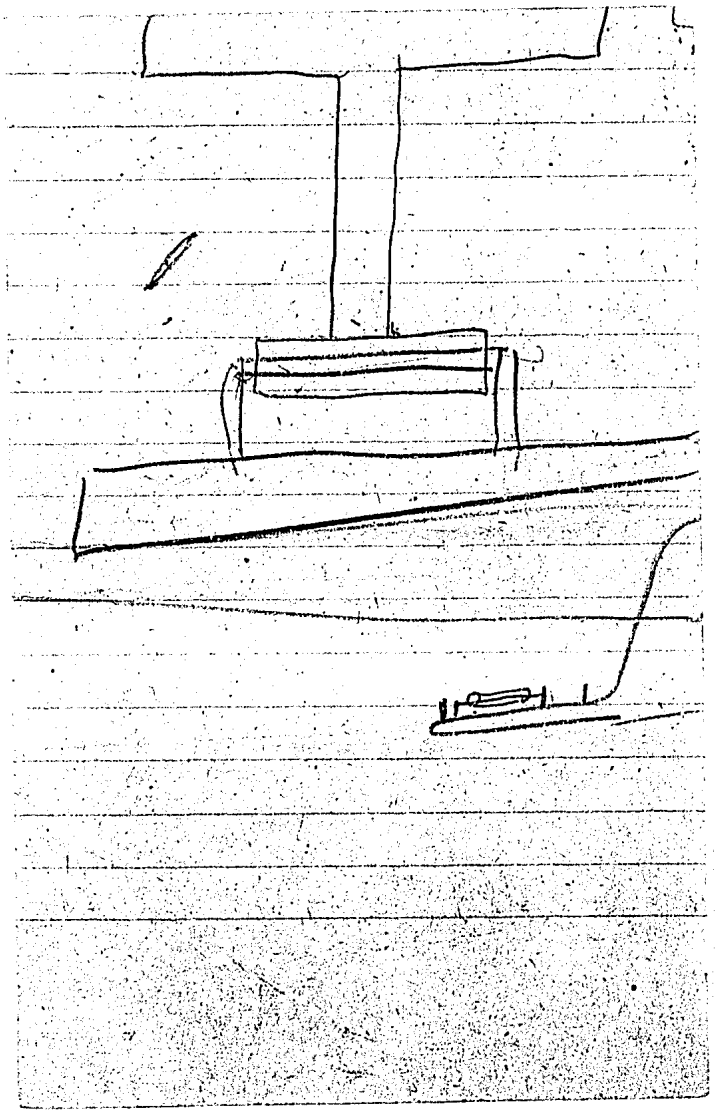

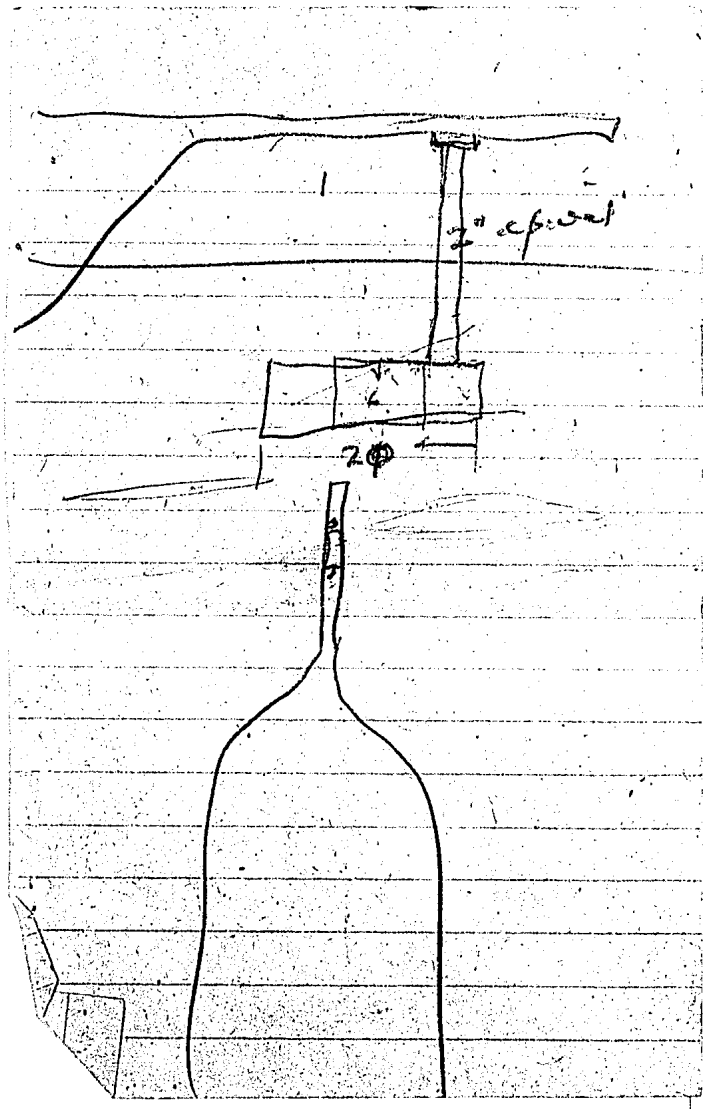

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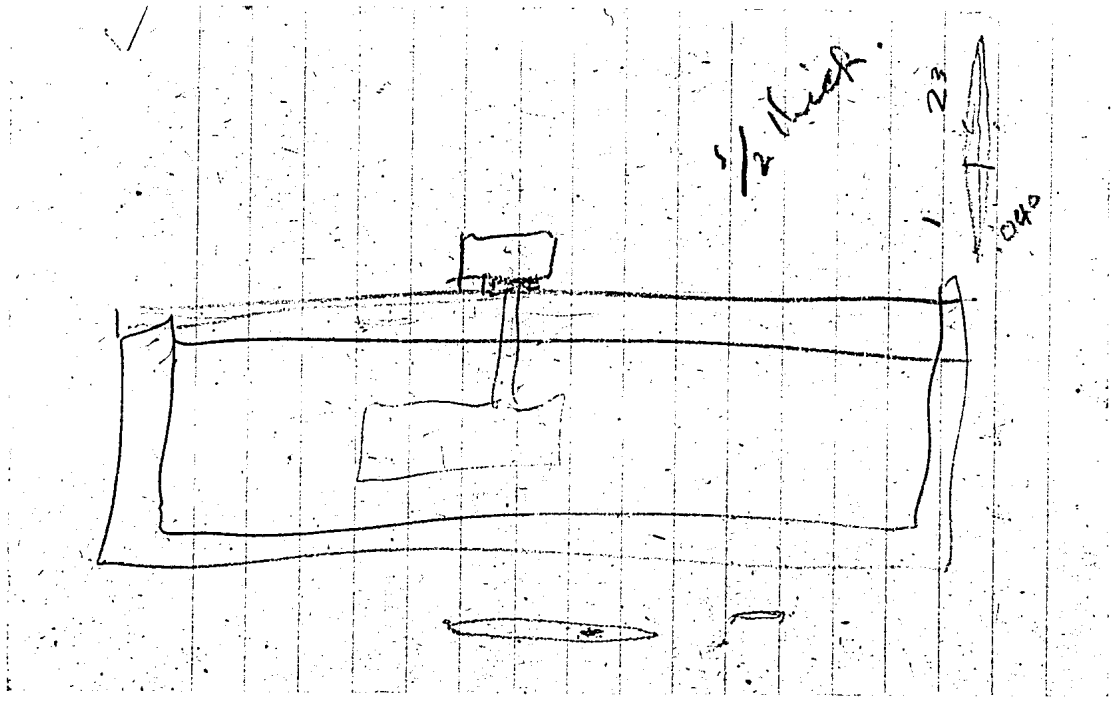

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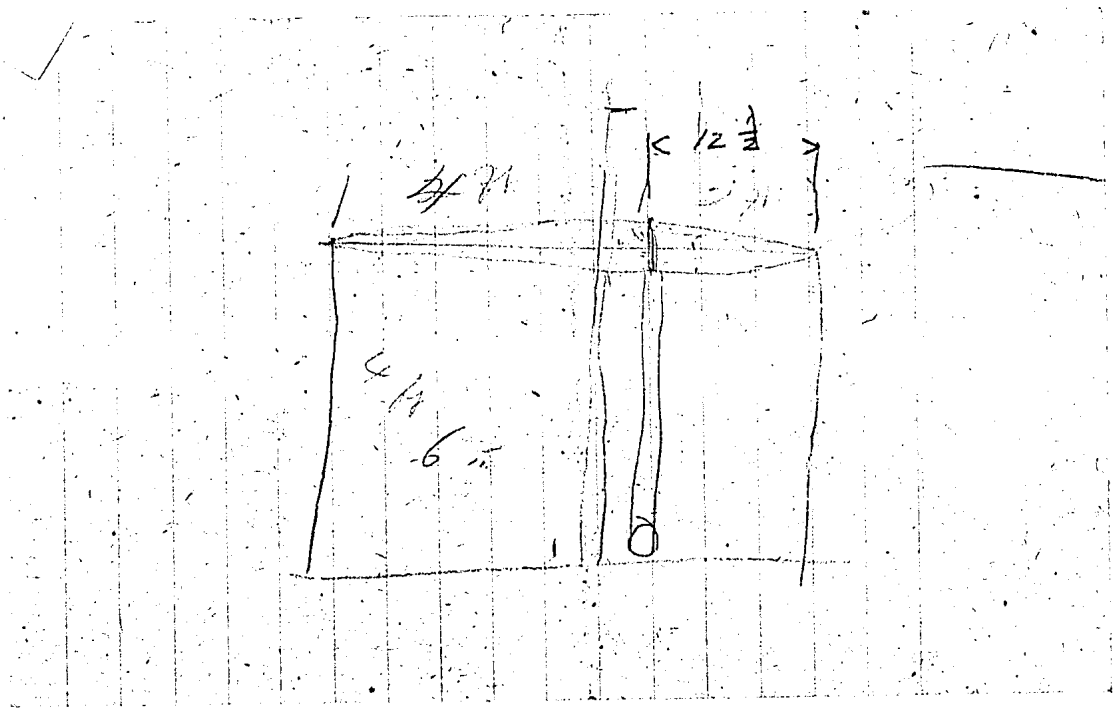
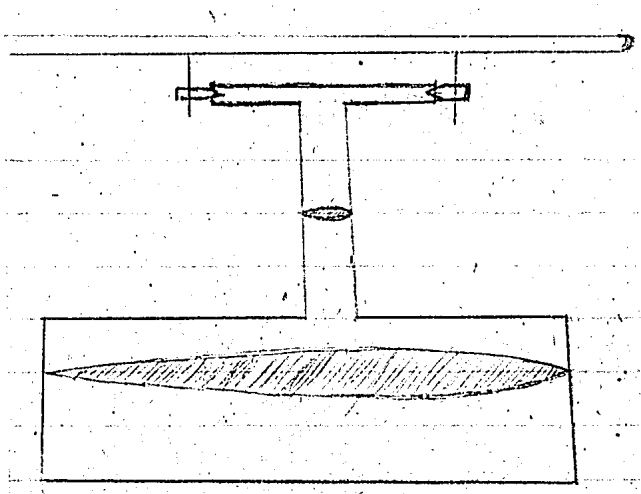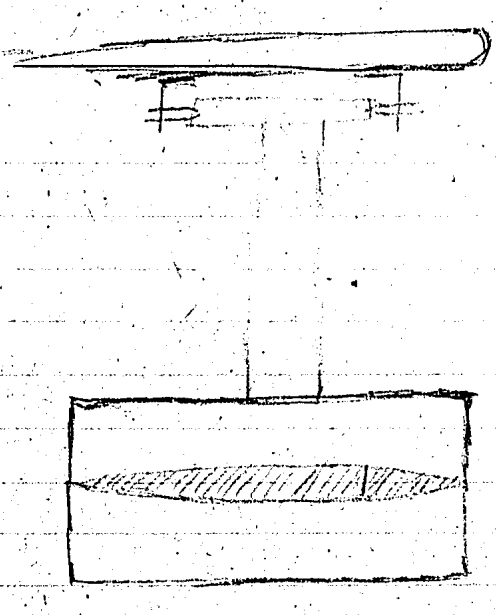
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